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August 2, 1954

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Washington, D. C.

Gentlemen:

This letter contains a proposal to undertake research and development in the field of Ionic Oscillators as described in attachment number one.

The program is designed to cover one year's work and cost $39,080.68. Schedule of costs and analysis of schedule are attached.

Due to the need for the development of subminiature transmitters and the inherent possibilities of the Ionic Oscillator in this regard, plus the accomplishments of this laboratory in that field, it is hoped that this proposal will meet with your approval and a contract will be negotiated.

Very truly yours,

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Enclosure

DOCUMENT NO. 13
NO CHANGE IN CLASS. ☐
☐ DECLASSIFIED
CLASS. CHANGED TO: TS S (C)
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PROPOSAL ON IONIC OSCILLATORS

INTRODUCTION:

The present-day electronic oscillator is basically composed of a vacuum tube and associated components such as resistors, condensers, coils, etc. In addition, a source of electric power is needed to energize the circuit. The power supply consists of batteries in its simplest form or an arrangement of a transformer, tubes, condensers and resistors, etc. in its most practical form. The power source must have a minimum of 100 Volts DC available. The current drain, both of the power supply and oscillator, is about 3 Watts for the smallest "miniature class" oscillator. Furthermore, the mere grouping together of these components results in a bulky unit.

An ionic oscillator is a gas tube which, under certain conditions, can be made to oscillate by itself and be completely independent of any external components. This is possible by making use of the positive ions in a gas tube in a manner similar to the way in which electrons operate in a vacuum tube. Because of this inherent characteristic of a gas tube, the ionic oscillator is unique in that it needs no external resistors, condensers, coils, etc. in order to operate.

PRESENT STATE OF THE ART:

To date there have been over two hundred papers written on ionic oscillations, most of which have been devoted to a fundamental study of the phenomena. The practical aspects of ionic oscillators have been neglected except for Cobine of General Electric, who constructed a noise generator using an ionic oscillator

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in a magnetic field; Fairbairn, (Toledo, Ohio) who obtained a patent on a gas tube used as an ionic oscillator; Chetverikova, (Moscow) who reported results similar to Fairbairn but of a much broader scope and in great detail.

This laboratory repeated the work of Fairbairn with results well within the limits of experimental error. In addition we succeeded in making an NE-2 50X1 type neon bulb oscillate, whereas Fairbairn reported negative results with neon.

The ionic oscillator does need a power source, but these requirements are quite simple. A small hearing aid battery (22½ Volts) is sufficient in many cases to operate the ionic unit. There is little or no problem with current drain in some cases. The relative output of an ionic oscillator can be sizable with low power requirements because there are not the same electrical losses to contend with as are found in an electronic power supply and oscillator. Each component of the latter consumes power which subtracts from the over-all efficiency of the system.

There are many commercially available gas tubes which are miniature and subminiature in size, and since the power supply need only be a small battery or its equivalent, the entire assemblage could be miniaturized or even subminiaturized. Further, such size reduction allows for shock resistent packaging, when necessary, with slight increase in over-all size.

The ionic oscillator is limited in frequency range because its upper limit of response is near 10 megacycles. However, below that frequency the ionic oscillator holds possibilities of being substituted in many applications which today are attainable only with the electronic oscillator and its associated components.

The existence of some significant possibilities have already been recognized by this laboratory. They are:

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PROGRAM:

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It is with this awareness, supported by experiments conducted at this laboratory, that it was thought desirable to propose the following program.

1. Objectives.

a. Check all available miniature and subminiature gas tubes for ionic response such as

Miniature	Subminiature	
2D21	CK1034	CK5783
5695	CK1035	CK5783WA
0A2	CK1036	CK5787
0B2	CK1037	CK5787WA
	CK1038	CK6213
	CK1039	RK61
	CK1042	

b. Select one or more for best charecteristics and build oscillator and detector system.

c. Demonstrate ionic oscillator and detector unit.

d. Deisgn line coupling device for house circuits.

e. Design receiver to match (d).

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h. Demonstrate unit.

2. Reports.

Reports will be submitted quarterly describing scope of work covered, results obtained, and plan of work for next quarter.

3. Time.

This program is estimated to take twelve months contingent upon clearances of manpower.

4. Cost.

It is estimated that twelve months operation of this program will cost $39,080.68. The schedule of costs is attached.

4A. Schedule of Costs.

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TOTAL ESTIMATED COST & FEE (12 months)	$ 39,080.68

Physical security expense requirements would be additional as they are not included in estimate.

Estimate based on best available information. Neither party is bound by it, but both parties should be willing to approach the problem from this point.

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4B. Analysis of Cost Schedule.

Personnel	Hourly Rate	Hours	Total
Senior Engineer			
Junior Engineer			
Draftsman			
Consultant			

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Hourly rates based on current standard rates used in electronic industry

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Material and supplies 3,500.00

Tubes - 17 types, 24 each @ $ 7.00
Batteries 200.00
Components 44.00

Laboratory equipment 1,500.00

Meters, voltage and current, for plate, screen, grid, filament and cathode measurements
Regulated power supplies, frequency meter, etc.

Laboratory work surfaces 1,500.00

Storage cabinets, tables, etc. to be purchased

5. Additional Space Required.

Additional floor space will be needed for the performance of this task. Our present landlord is willing to construct a second story on top of our present premises which will add another thousand square feet of space. The total rent for both floors would be $190.00 per month. (We now pay $125.00 per month.) This transaction could be accomplished in the form of a one year lease with option to renew.

Permission is respectfully requested to negotiate a lease for the above mentioned space in order to facilitate this task.

6. Physical Security Required.

Assistance is urgently requested in establishing the degree of physical security demanded by the classification of this task. In view of the fact that leasing additional space is contemplated and that the landlord will cooperate in altering some of his construction plans, a conference between the Security Officer and contractor may well be of mutual advantage.